DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

REPLY TO
ATTN OF: LEED

SUBJECT: Engineering Technical (ETL) 90-8:
Guide Specification for ETHYLENE PROPYLENE DIENE MONOMER (EPDM) Roofing

TO: See Distribution

1. Purpose: This letter provides a roofing guide specification (attachment 2) to use when specifying EPDM Elastomeric single-ply roofing system. This ETL is authorized by AFR 8-7, Air Force Engineering Technical Letters (ETLs).

2. Effective date: immediately.

3. Referenced publications:

a. AFR 91-36, Roof Management Program.

b. AFR 88-15, Air Force Design Manual - Criteria and Standards for Air Force Construction, Chapter 7.

c. AFM 91-31, Maintenance and Repair of Roofs.

4. Description/Implementation:

a. Use of single-ply roofing systems require MAJCOM approval IAW AFR 91-36. When approved, use of this guide specification is mandatory for all EPDM roofing projects which are still in the design stage. This specification is tailored for CONUS use; OCONUS locations should modify requirements to meet host country design standards.

b. This specification contains specific notes to the designer. Read each note and modify this standard specification to meet individual project requirements. Do not include specifiers' notes in the contract documents. This specification mandates the roofing system manufacturer to: a) certify the qualifications of the contractor; and b) sign the Air Force 15-year labor and material warranty (submittal 4). Do not make changes to the AF Warranty.

5. The action officer for this ETL is Mr. Julian L. Ius, P.E., HQ

AFESC/DEMM, DSN 523-6236.

CHARLES L. PEARCE, Colonel, USAF
Chief, Installation Development Division
Directorate of Engineering and Services

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Attachment 1

ETL 90-08
17 OCTOBER 1990

ENGINEERING TECHNICAL LETTER

ELASTOMERIC SINGLE-PLY ROOFING ETHYLENE PROPYLENE DIENE MONOMER (EPDM)

DIRECTORATE of ENGINEERING AND SERVICES
INSTALLATION DEVELOPMENT DIVISION
ENGINEERING BRANCH

AIR FORCE ENGINEERING & SERVICES CENTER
DIRECTORATE OF OPERATIONS & MAINTENANCE

Engineering Technical Letter

ELASTOMERIC SINGLE-PLY ROOFING
ETHYLENE PROPYLENE DIENE MONOMER
(EPDM)

GUIDE SPECIFICATION

DIRECTORATE OF OPERATIONS & MAINTENANCE
AIR FORCE ENGINEERING & SERVICES CENTER
TYNDALL AIR FORCE BASE, FLORIDA 32403

ELASTOMERIC SINGLE-PLY ROOFING (EPDM)
GUIDE SPECIFICATION

INDEX

GUIDE SPECIFICATION FOR ELASOMETRIC SINGLE PLY ROOFING

PART 1 - General

SPECIFIER:

1. This specification covers Ethylene Propylene Diene Monomer (EPDM) Elastomeric sheet roofing. Use of loose-laid and ballasted EPDM system is not recommended due to the inherent difficulty in locating and repairing leaks. Ballasted EPDM systems may be specified if approved by your MAJCOM Roofing Manager, modify this spec accordingly. To enhance maintainability, only adhesively bonded elastomeric systems should be specified. For adhesively bonded system, specify a membrane thickness of 0.060 inches. Insulation under adhered membrane must be attached to the substrate with mechanical fasteners. Membrane cannot be adhered directly to unfaced perlite, polyurethane, polystyrene or isocyanurate insulation.

2. This roofing system should not be used in areas exposed to waste products such as petroleum, grease, oil, and solvents; vegetable or mineral oil and animal fat; and steam venting.

3. Special attention must be given to roof mounted mechanical and electrial equipment, and penetrations. Avoid locating mechanical and electrical equipment on and penetrating through the roof membrane where practical. When it is absolutely necessary to locate equipment on or penetrate through the roof membrane, comply with the following:

A. Mechanical units should be mounted on continuous wood curbs or on steel supports raised high enough above the deck to facilitate future repair or re-roofing under the units. Every equipment support must be firmly fastened directly to the building structure or roof deck to help isolate vibration from the flashing.

B. Mechanical units should not restrict the flow of water. Crickets should be installed on the high side to provide good drainage.

C. Roof penetrations should never be located in valleys or drain areas.

1.01 DESCRIPTION OF WORK.

A. Furnish the administration, facilities, materials, labor, equipment, and quality control (QC) necessary to integrate the work into the total building system so that leakage into the roofing system or building does not occur. The roofing system is an assembly of components including

the underlayment and insulation as applicable, roofing membrane, elastomeric and metal flashings, and all related parts necessary to complete the assembly. The roofing system manufacturer is the elastomeric membrane manufacturer, who may or may not manufacture and market the other components of the roofing system. The manufacturer or his licensed/approved installer shall complete the work and provide a material and labor warranty for a fifteen-year period from date of final acceptance of the building. The 15-year government warranty (Submittal #4) shall be signed by the EPDM system manufacturer and provided to the contracting officer prior to final acceptance.

B. QC procedures, tolerances, testing, and requirements are specified in these contract documents. Nonconforming work will be rejected as a violation to these specifications.

1.02 QUALITY ASSURANCE (QA):

A. As specified herein, provide the QA evidence needed to establish confidence that QC is being performed adequately.

B. Except-as modified and supplemented herein, follow the published requirements for methods of installation and written recommendations of the elastomeric roofing membrane manufacturer and other materials manufacturers.

C. The specified QA requirements are minimums. The contractor shall provide additional QC if, in the opinion of the contracting officer, the QC is not effective enough to provide conforming work. This additional QC does not constitute a change to the contract.

D. The QC is subject to audit by a government inspector and the contractor shall provide all information necessary for the audit.

1. The government is not obligated to inspect a contractor's work nor to protect a contractor from the consequences of malperformance of his work force. Government inspection is a general examination of the contractor's conduct and work, and is solely for the purposes of the government. Government inspectors do not have the authority to accept any work, whether it be conforming or not. Government inspection is not to be construed as conclusive. Information that may be offered to the contractor does not change the contract.

2. Government agents including inspectors, engineers, and QA evaluators are not authorized to change the contract. This lack of authority extends to all situations in which the actions of those agents could be construed as constituting a change.

E. Provide Quality Control (QC) defined as follows:

1. Quality Control is the regulatory process by which the contractor measures actual quality performance, compares it with standards, and acts on the differences. The QC function is the entire collection of activities through which fitness for use is achieved.

2. Contractor inspection is a careful and critical investigation of all work to verify that it conforms to the contract, and to detect variances and act to correct them in time to prevent reworking and delay. on discovery of variance, the contractor will immediately institute corrective action and insure all future work conforms to the requirements of the contract.

3. Hire or appoint a representative to act as Quality Controller. The Quality Controller is to have at least five years experience in the installation of elastomeric roofing systems.

4. Before the start of roofing work, the Contracting Officer will schedule a preconstruction conference at the air base to review the contract. The Quality Controller and foreman or superintendent must attend the conference. Technical representatives from both the elastomeric membrane and insulation manufacturers shall also attend the preconstruction conference. These representatives shall be knowledgeable in the installation peculiarities and compatibilities of their products. Contractor and technical representative will present oral and documented installation procedures to be used. This conference may include a visit to the work site.

5. Basic QC requirements appears in part four of these specifications. As a minimum, the Quality Controller shall perform each of the actions listed on a daily basis. Failure to perform these actions constitutes failure to perform and entitles the government to terminate the contractor for default.

1.03. SUBMITTALS. Submittals 1 through 6 are included at the end of this specification. Additional submittal forms shall be obtained from the contracting officer if required. Submit requests for all changes (including resolution for variances) in writing. Do not proceed with any changes without written authorization of the contracting officer. Approvals of submittals which do not conform to the contract shall not be construed as a change unless such nonconformance is a change specifically so indicated on the submittal and approved by the contracting officer.

SPECIFIER: Text for each required numbered submittal is located at the end of the specification; do not alter the text or format of these submittals. Some contractors cannot obtain these submittals and are therefore unacceptable. Bids that do not contain Submittal #1 or not executed prior to award shall be considered nonresponsive.

A. Submittal #1. The EPDM System Manufacturer's Certification (Submittal #1). Submittal #1 is a qualification for award of this contract. It must be submitted as part of the bid, or executed prior to contract award, and be accepted by the contracting officer.

B. Submittal #2. System Summary Sheet. It must be signed by both the perspective contractor and elastomeric membrane manufacturer, and submitted to the contracting officer prior to contract award. This document is tailored to present project requirements to the system manufacturer who can then ascertain the technical aspects of the project and the acceptability of the design to their 15-year warranty system.

C. Submittal #3. Designation of Roofing Quality Control Controller. The most effective means to evaluate quality installation is by thorough, continuous visual examination at the time of installation, conducted by a person who is knowledgeable in roofing technology and good workmanship practices. The contractor shall designate a person to be in charge of roofing quality control. The quality controller shall have at least 5 years experience in the supervision and inspection of single-ply roofing and shall not be a principal or officer of the roofing contractor's company. The Air Force inspector will audit the quality control process on a daily basis. The contractor must furnish Submittal 3 as required herein, modified as necessary, to identify the person in charge of roofing quality control. This submittal must be approved by the contracting officer before the Notice To Proceed (NTP) is issued.

D. Submittal #4. The Air Force EPDM Roofing System 15-Year Labor and Material Warranty. The manufacturer shall provide an executed copy of the 15-Year Warranty (Submittal #4) upon satisfactory completion of the roofing system. The warranty is to be provided to the contracting officer prior to final acceptance of the project.

E. Submittal #5. Sample Identification. Use attachment #5 for submittal.

F. Submittal #6. As-Built Roof Summary. The contractor shall submit this summary upon completion of this project.

G. Materials Approval. Within 10 days after award of contract, the contractor shall submit to the contracting officer, certifications from the insulation and fastener manufacturers/suppliers that the materials to be used conform to specified standards as applicable to produce the elastomeric manufacturer's 15-year warranted system.

1. Within ten (10) days after issuance of Notice to Proceed and before start of work, submit:

a. Evidence the approved materials have been ordered.

b. Four copies of:

(1) Latest edition of elastomeric membrane manufacturer's published general requirements, technical literature, repair instructions, and material safety data sheets for each system to be used in this contract.

(2) Latest editions of all other materials manufacturer's product and installation literature.

2. Membrane Lots and Samples:

a. Factory certified test certificates from each lot of elastomeric membrane installed shall be furnished along with two (2) pieces, 12 inches square on receipt at job site. For this purpose, a lot shall be considered one shift (6 or 8 hours) of production from internal mixer and/or calendering operation. Internal mixer production charts will be retained for two (2) years for each lot produced and shall be made available for inspection in the event of membrane failure. Internal laboratory test records for compound specific gravity, tensile strength, elongation, and rheology shall be retained for each internal mixer batch in each lot for a two (2) year period and shall be made available for inspection in the event of membrane failure.

b. Contractor shall furnish at his expense on request of the Contracting Officer test results of a minimum of one lot up to_____lots performed by a recognized testing laboratory such as Smithers Scientific Services, Akron Rubber Development Laboratory, or other such approved entity. Test results will show elastomer type, tensile strength, Die "C" tear, elongation, and specific gravity.

SPECIFIER: Suggest one test per 200 squares - insert figure

3. Before final acceptance, submit:

a. A plan view drawing of each roof showing location and dates of installation of each lot of membrane, identified by manufacturer's lot number.

b. As-Built Roof Summary (Submittal #6)

c. 15-Year Warranty Certification (Submittal #4)

1.04. ACCEPTANCE OF COMPLETED WORK.

A. Acceptance of completed work will be based on its conformance to the contract. Nonconforming work will be rejected; the government is not obligated to accept nonconforming work at a reduced price. Contractor shall start replacement or correction of rejected work within 10 calendar days after receipt of the rejection notice. Otherwise, the government may have this work done by others and charge the cost to the contractor.

B. A signed final acceptance certificate by the Contracting Officer issued to the contractor is the only final acceptance under the Inspection and Acceptance Clause of this contract.

SPECIFIER: Delete products or items that do not apply to the project. Add items as needed, renumber as necessary.

PART 2 - PRODUCTS

2.01 ABBREVIATIONS:

A. APA (American Plywood Association)

B. ASTM (American Society for Testing and Materials)

C. AWPB (American Wood Preservers Bureau)

D. FM (Factory Mutual Engineering Cooperation)

E. PS (Federal Specification or Federal Standard)

F. NELMA (Northeastern Lumber Manufacturer's Association)

G. SPIB (Southern Pine Inspection Bureau)

H. WWPA (Western Wood Products Association)

2.02 ROOF SYSTEM COMPONENTS: Elastomeric EPDM membrane, shall conform to the general requirements of ASTM D-4637, 0.060 inches in thickness, that meets or exceeds the following physical properties:

Physical Property	Test Method	Minimum Test Result
Color		Black
Specific Gravity	ASTMD-297	1.12
Tensile Strength	ASTMD-412	1300 psi
Elongation at Break	ASTMD-412	300%
Tear Resistance (Die C)	ASTMD-624	175 lb/in.
Sheet Composition	ASTMD-297	
% Polymer that is EPDM		100
% Sheet that is Polymer		30

SPECIFIER: EPDM single ply membranes are for use on roofs from 1/4 inch to three inches per foot slope. For roofs of greater slope, a reinforced Hypalon sheet can be considered, but might prove more expensive than shingles or standing seam metal construction. Consult MAJCOM Roofing Engineer for advice and material specification for reinforced Hypalon elastomer.

SPECIFIER: This specification can be modified and used for the construction of a "Protected Membrane Roofing (PMR)" system (or commonly called inverted Roofs). Designer must investigate the facility structural capacity to support a ballasted PMR system. PMR's must be installed in strict compliance with the manufacturer's published technical requirements.

2.03 CEMENTS AND PRIM

Cements and Primers used for splicing, patching, and flashing shall be compatible to the polymers furnished, furnished by the same manufacturer as the membrane elastomer, and meet the manufacturer's published specifications for same.

2.04 FLASHINGS

A. Metal Flashings: Metal flashings shall be at least 26 GA. Galvanized steel or 22 GA. Aluminum, compatible with elastomeric membrane manufacturer's published flashing details.

B. Elastomeric Flashing: Elastomeric flashing can be furnished in vulcanized or uncured condition, depending on membrane manufacturer's recommendation. When cured, both types shall meet or exceed the following test values:

Property	Test Method	Test Value
Tensile Strength	ASTMD-412	1200 psi
Elongation @ break	ASTMD-412	400%
Brittleness Temperature	ASTMD-746	-40øC
Tear Resistance Die C	ASTMD-624	140 lb/in.
Resistance to Ozone	ASTMD-1149	No Cracks

2.05 SEALANTS

A. Lap sealant shall be a one part elastomeric caulking/adhesive sealant furnished by elastomeric membrane manufacturer according to his latest published catalog. Shelf life shall be marked clearly on containers: "Do I not use after_____;" and use will not be permitted of expired material. Store and apply according to manufacturer's installation instructions.

B. Sealant for difficult to flash penetrations or objects shall be an elastomeric, pourable material furnished by membrane manufacturer according to his latest published catalog. Shelf life shall be marked clearly on containers: "Do not use after_____;" and use will not be permitted of expired material. Store and apply according to manufacturer's installations instructions.

C. Water cut-off sealant is to be used for end of day stopping point and shall be an elastomeric sealant to adhere and seal space at edge of membrane and substrate. It will be furnished by elastomeric membrane manufacturer and meet his latest published catalog requirements. Store and apply according to manufacturer's installation instructions.

D. Other sealers, tack coats, and tapes used shall be compatible to the elastomeric membrane and shall be as furnished and recommended by membrane manufacture. Use shall be according to manufacturer's recommendations and within the shelf life period designated on the containers. Asphalt or coal tar derivative products are not to be used in this construction.

2.06 FASTENERS:

Fasteners shall be as recommended by the elastomeric membrane manufacturer for the type of deck, type and thickness of insulation, and fastening requirements of the manufacturer's system, UL, local building code, or insurance requirements, whichever is most stringent. Fastener spacings shall meet FM approval Guide for I-90 windstorm rating when used with the selected insulation. Fasteners shall be galvanized steel or other noncorroding material employing plastic washers of a size recommended by the EPDM manufacturer. Washers, batten strips, and metal

flashings or clips will be protected from contact with dissimilar metals in fasteners or companion accessories to preclude electrolytic corrosion. Length of penetration into substrate deck, wall, or nailer shall be sufficient to prevent backing out by vibration, shrinkage, or swelling action.

2.07 WOOD PRODUCTS

A. Lumber Species: Choose from the following: Douglas fir, northern white pine, ponderosa pine, southern pine, Jack pine, and red pine.

B. Grades: Choose among WWPA, NELMA, or SPIB grading rule for the specified grades for lumber provided. Plywood panels shall meet the requirements of the latest edition of U.S. Product Standard PS1.

1. Exterior trim, soffits, and wood exposed to view:

a. Lumber:

(1) WWPA and NELMA: Selects and finish class "D" select grade or

(2) SPIB: "C" finish grade

2. Enclosed and incorporated into the roof system (i.e., nailers, sleepers, blocking, and decking):

a. Lumber:

(1) Thickness less than 2" and all widths:

(a) WWPA and NELMA: Board Class, No: 2 common grade or:

(b) SPIB: No: 1 Boards.

(2) 2 x 2 through 4 x 4: SPIB, WWPA, and NELMA: Structural light framing class, No. 2 grade.

(3) 2 to 4 inches thick, over 4" wide: SPIB, WWPA, and NELMA: Structural joists and planks class, No. 2 Grade.

b. Plywood: American Plywood Association (APA) veneer grade A-C, plywood, exterior.

(1) Plywood for all uses except decking, choose from the following:

(a) C-C EXT-APA

(b) C-D INT-APA with Exterior Glue

(c) Structural I or C-C EXT APA

(d) Structural I or C-D INT-APA with exterior glue.

(2) Plywood for decking minimum 1/2 inch thickness or as shown in drawings. Choose from the following:

(a) CC-EXT-APA

(b) Structural I or II C-C EXT APA

C. Preservative Treatment:

1. Exterior trim, soffits, and wood exposed to view: Do not treat with preservatives.

2. Enclosed and incorporated into the roof system: AWPB specification LP-22 standard for lumber, timber, and plywood pressure treated with water borne preservatives for ground contact use, (July 1975) except, do not use acid copper chromate (ACC) preservative.

D. Moisture: The moisture content for lumber and plywood is to be 12%, plus or minus 2% at delivery, in storage, at installation, and be maintained within those tolerances until painted or enclosed and incorporated into the roof system. Wood found exceeding that moisture level shall be conspicuously marked and removed from the job site. Before preservative treatment, wood products shall have been kiln dried to 12% moisture content. After pressure treatment, wood shall be kiln dried to the 12% moisture content again, and protected during shipment and storage.

E. Marking:

1. Each piece of lumber must bear a grade stamp or grade mark showing the association under whose rules it was graded, the grade, the species, and either "S-DRY", "KD", or "MC-15".

2. Each piece of plywood must bear the APA grade trademark.

3. Each piece of preservative - treated lumber and plywood must bear the AWPB Quality Mark.

2.08 EXPANSION JOINT COVER: Expansion joints and covers shall be installed in the locations depicted in the plans. Materials and installation detail shall be as recommended by the elastomeric roofing membrane manufacturer in his latest published technical manual or installation guide.

2.09 ASPHALT/CONCRETE WALKWAYS: Install as detailed and shown on the drawings IAW manufacturer's technical requirements.

A. Asphalt Plank: Preformed mineral surfaced asphalt plank or granular surfaced treads consisting of asphalt plasticizers, fibers, and inert fillers, not less than 1/2-inch thick as shown on drawings.

B. Precast Concrete Paver Block: Precast concrete pavers, sized as indicated, without sharp edges and projections, shall be furnished as shown on the drawings. Provide an additional elastomeric sheet under concrete pavers or protection as recommended by the manufacturer.

2.10 FIRE SAFETY: The complete roof covering assembly shall have UL 790 Class A or B classification, be listed as fire-classified in the UL Building Materials Directory, or listed as Class I roof deck construction in the FM Approval Guide.

2.11 WINDSTORM RESISTANCE: The complete roof covering assembly shall be capable of withstanding an uplift pressure of 90 pounds per square foot when tested in accordance with the uplift pressure test described in the FM Loss Prevention Data Sheet 1-28.

PART 3 - EXECUTION:

3.01 ROOFING QUALITY CONTROL

A. Quality Controller shall review each day each significant feature and segment of the work.

B. All material shall be delivered to the site in protected trucks with packaging intact and readable labels. Use materials having labels that:

1. Identify the material and source.

2. Indicate conformance with the reference standard applicable to the material.

3. Indicate expiration of shelf life.

4. Indicate storage requirements. (if any).

5. Identify lot and/or batch numbers of elastomeric materials.

C. Collect samples, 2 pieces, 12" x 12" each, of each lot of elastomeric roofing membrane. Plainly mark and dispatch as required for laboratory testing as directed by the Contracting Officer. Cost for sampling and testing shall be borne by the contractor.

D. Store and handle all materials as follows:

1. Do not expose materials to moisture in any form before, during, or after delivery to site.

2. Store material in a completely enclosed building or trailer if possible. If necessary to store outdoors, stack materials on platforms or pallets at least 4 inches above ground and cover with waterproof canvas. Allow air circulation under canvas so condensation does not occur; do not extend to ground. Remove nonweathertight plastic manufacturer supplied packaging from insulation prior to storage; tear off labels and tuck in insulation stack for identification purposes.

3. Conspicuously mark unprotected or damaged materials and remove from the site.

4. Follow manufacturer's instructions on sealers, caulking, tapes, cements, and potting compounds with regard to temperature of storage and provide heated or cooled storage as required.

E. Program work so that each area of the roofing system installation is completed the same day it is begun. Included are the roof membrane and all flashings within or attached to the membrane. Remove all installed material from areas where the system was begun to be installed but not completed on the same day, and do not reuse.

1. Install temporary water cutoffs and tie-ins at the end of each workday. Remove temporary cutoffs and tie-ins so that all vertical faces of insulation are exposed at the beginning of the next day's work.

2. Do not cut the staggered insulation pieces that are already installed. Fill in the staggered sections to a straight edge line with unattached cut pieces of insulation, but do not include the temporary filler places in the permanent roof system.

F. Except for expedient temporary work, do not proceed with roofing work during inclement weather. Remove all temporary work and insure dry surfaces and components before installing permanent components and materials.

3.02 OPERATIONAL PROCEDURES

A. Confine equipment, storage of materials and debris, and the operations and movements of workmen within limits as indicated or as directed by the Contracting Officer. Do not load or permit any part of a structure to be loaded with a weight that will endanger its safety of cause damage.

B. Protect the building, all contents, and the surrounding area from damage and building occupants or passersby from injury during the work. Do this so it will not affect the normal conduct of operations in and around the building. The contractor must determine the nature of those operations and provide proper protection. Contractor to repair all damage at his cost caused by lack of such protection to the Contracting Officer's satisfaction. If repairs are not made, or if the Contracting Officer determines that repairs are beyond the contractor's ability, the government will have the work done by others and charge the cost to the contractor. Contractor shall give timely notice to inform the building occupants of scheduled roofing operations.

C. Remove all debris daily from the roof. Use enclosed chute, crane and bucket, or construction hoist to minimize and contain dust, dirt, and noise.

D. When wheeled or other traffic over the partially or fully completed roofing is unavoidable, use adequate plank or plywood protection for the roofing.

E. Provide at least one (1) portable ammonium phosphate or other dry type fire extinguisher at the work site in case of electrical or solvent fires.

3.03 PREPARATION FOR ROOFING

SPECIFIER: Indicate existing roofing components to be removed and disposed of for each of the buildings included in this project. Removals shall be done on buildings (list).

A. Removals must result in a clean, dry substrate, except for residual stains, providing a surface suitable to apply new materials. A substrate surface is suitable when application of new materials results in a uniform, positive, and maximum contact between such materials and the substrate. Remove all collections of debris in decking ribs or crevices.

B. Contractor will check roof drains for free flow before and after completion of work. Keep debris out of roof drains during construction and return to operable condition at completion of work.

C. Repair existing deteriorated decking in the following manner:

SPECIFIER: List by building the type of deck, amount of area involved or estimated, etc. It may be better to add a separate specification if deck repairs are extensive. It is desirable to have a separate schedule in the bid request to establish a unit price for deck repair by type if areas are unknown or indeterminate. An estimate of quantity will be required for that purpose.

D. Remove existing roof-top equipment from buildings as follows:

Building	Equipment	Reinstall/Store/Scrap

All equipment shall remain government property and be returned to its roof top site or as directed by the Contracting Officer unless designated to be scrap.

SPECIFIER: List all buildings with equipment to be removed and dispositions of same. Show same information on drawings.

E. Lift or remove metal and metal accessories indicated to remain to aid in the installation of new materials.

F. If conditions are uncovered or created that would be detrimental to the application of specified work, immediately notify the Contracting Officer for determination of treatment.

SPECIFIER: Include additional paragraphs on roofing preparation as necessary for particular project, lettering-them as necessary.

3.04 UNDERLAYMENT INSTALLATION

Follow elastomeric membrane manufacturer's recommendation for underlayment and deck sealing in his current published technical manual or installation guide. Should a condition occur not covered in published literature, a written, signed letter from the manufacturer must be furnished for approval before proceeding with the work.

3.05 INSULATION INSTALLATION

SPECIFIER: Include item A for all projects requiring insulation. It is the specifiers responsibility to determine the need for a vapor retarder. If required, install IAW membrane manufactures' technical requirements for vapor retarders.

A. General Requirements:

1. On slopes of 2 inches per foot or more, provide treated wood insulation stops according to the insulation manufacturer's requirements.

2. Secure cant and tapered edge strips in place with adhesive or fastener specified by membrane manufacturer. Cut and neatly fit all joints and miters.

3. Insulation board, cant strips, and tapered edge strips that can be readily lifted or displaced by hand are not adequately secured. Reinstall adequately all lifted and displaced items that are not damaged. Replace damaged items with new materials.

4. Follow additional applicable requirements of the insulation and membrane manufacturers.

B. Over Steel Deck:

1. First (bottom) layer:

a. Place insulation with long side of boards parallel with deck flutes so that side joints between boards do not occur over the deck ribs.

b. Stagger and joints by maximum dimensions. Bring boards unto moderate, uniform edge contact.

c. Secure all insulation boards in the first layer with mechanical fasteners over the entire roof deck in accordance with FM, UL, or membrane manufacturer requirements, but no less than six fasteners per 3 ft by 4 ft board. Filler pieces must have at least two fasteners.

d. Use driving methods prescribed by the fastener manufacturer.

2. Second or Additional Layers: Follow installation instructions of membrane manufacturer for subsequent layers of insulation or recovery board.

3.06 MEMBRANE INSTALLATION

A. Apply membrane according to elastomeric membrane manufacturer's published instructions and the following requirements.

B. Fully Adhered Application: Apply adhesive evenly and continuously to substrate and underside of sheets at rates recommended by elastomeric sheet manufacturer's printed application instructions. Allow adhesive to dry to consistency prescribed by manufacturer before adhering sheets to the substrate. Roll each sheet into adhesive to avoid wrinkles; broom or roll to remove air pockets and "fishmouths" and to ensure full, continuous bonding of sheet to substrate. Clean both mating surfaces at splice area, apply adhesive, lap adjoining sheets a minimum of 40, and seal seams by centering a 6-inch wide uncured flashing along all field splices.

C. Walkways around mechanical roof top equipment and access ways are to be placed as shown on the drawings. Installation shall be in accordance with the manufacturer's detailed requirements.

3.07 FLASHING AND FLASHING ACCESSORIES: Flashing, including perimeter flashing, flashing around roof penetrations, and prefabricated pipe seals, shall be 0.60 inch minimum thick uncured neoprene or uncured elastomeric sheet, as recommended by the elastomeric sheet manufacturer's printed data.

A. All membrane field seams to be strip-in with a minimum of 6" wide uncured EPDM flashing materials.

B. Fabricate and install metal as shown on drawings. Conform to standards of the components and materials manufacturers, Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA). 8224 Old Courthouse Road, Tysons Corner, Vienna, Virginia 32180, and Copper Development Association, 1011 High Ridge Road, Stamford, CT 06905, as they apply to this project.

C. Reposition and reinstall all metal accessories indicated or designated to remain.

1. Replace missing or irreparable metal with the type, gauge, thickness, weight, and size of metal to match other existing sections or the removed section.

2. Clean and repair the metal as necessary and required.

3. The contractor is responsible to perform all the work required to make any displaced mechanical units operational. Included are repair, testing, and balancing to conform to the original level of performance as determined by the Contracting Officer.

D. Isolate dissimilar metals in contact by painting with a dielectric coating or by using an uncured nonconducting elastomeric sheet gasket.

E. Sheet Metal with Flanges:

1. Set metal flanges over composition flashings and on roofing membrane in a full bed of sealing cement furnished by the elastomeric membrane manufacturer.

2. Nail flanges to wood nailers, when present under membrane or flashing, such as at roof fasciae or gravel stops. Nail in two parallel rows 1 1/2 inches apart with one row 1/2 inch from the flange outer edge and staggered 3 inches on center with nails in the other row.

F. Roof drains and Scuppers: Follow applicable published requirements of the EPDM manufacturer or NRCA published details and procedures.

3.09 WOOD INSTALLATION

A. Provide wood members as indicated, necessary, and required for a complete, workmanlike system.

B. Provide fasteners at not more than 18 inches on center, and also within 6 inches of each end, to secure nailers to the building construction adequately, to resist pullout force of 200 lb per lineal foot of nailer.

C. Where nailers are stacked, secure the top nailer to the lower with spikes or nails of proper length, spaced is inches on center, staggered, and also within 6 inches of all nailer ends.

D. Brush apply one coat of concentrated solution of the preservative used in treatment onto all cut surfaces of preservative treated lumber.

3.10 SEALANT INSTALLATION

Follow sealant manufacturer's installation requirements, cleaning substrates so no contaminants will prevent bonding, priming as required, and installing back up material as required.

SPECIFIER: Some sections of this specification are to be modified for new construction or re-roofing jobs. Modify as required and submit to MAJCOM roofing engineer and/or HQ AFESC/DEMM roofing engineer any questions or furnish modified specification for review.

3.11. WARRANTY SIGN: Provide 10 inch x 12 inch minimum size painted signs (see example) made of aluminum with a dark color background and letters of contrasting color. Use paint compatible with the aluminum. Sign shall read as indicated. Permanently post signs at all access points leading to the roofs and prominent points on the roofs. Provide at least one sign mounted on each roof with additional signs on each building located where indicated on the drawing.

3.12. ROOF DRAIN TEST: After the roofing system is complete but prior to Government acceptance of the roofing, perform the following test of roof drains and adjacent roofing for water tightness. Plug roof drains, and fill drains with water for 24 hours. To ensure some drainage from the roof, do not test all drains at the same time. Measure water levels at the beginning and end of the 24-hour period. If precipitation occurs during the test period, repeat the test. If the water level falls, remove water, thoroughly dry and inspect the installation, and repair or replace roofing at the drain. Repeat the test until there is no water leakage.

3.13. INSTRUCTIONS TO GOVERNMENT PERSONNEL: Provide written and verbal instructions to designated Base Civil Engineering maintenance personnel. Instructions shall be provided by a competent representative of the roofing membrane manufacturer and shall include a minimum of 4 hours on inspection and maintenance of membranes. Repair of defects and/or damage to the membrane are to be repaired by the EPDM manufacturer's authorized and approved installer to preclude voiding the warranty.

PART FOUR - QUALITY CONTROL PROCEDURES

4.01. INTRODUCTION:

A. The Quality Controller has the responsibility to assure the government obtains products and services as required by the contract.

B. To accomplish that, he must continuously observe work in progress, including testing and measuring, and report findings on a daily record form (AF Form 1063, Quality Control Record, shall be used for this purpose).

4.02. QUALITY CONTROLLER: Before actual work begins, the Quality Controller must:

A. Read the specifications and study the drawings.

B. Understand the required tests and measurements.

C. Understand AF Form 1063, Quality Control Record, and reporting procedures.

D. Visit the roof and become familiar with its layout.

E. Attend the preconstruction conference.

4.03. EQUIPMENT: Supply the following equipment for tests and measurements required to be performed under this contract:

A. Measuring tape, 50 or 100 ft, ft and inches, nonconducting.

B. Moisture meter for determining moisture content of wood (such as nailers or curbing) at time of installation.

4.04. ALLOWABLE TOLERANCES: The following tolerances establish the range of acceptable variances. Assure that work outside this range is removed; act to prevent reoccurrence.

A. Dimensions: (plus or minus)

1. 1/16 inch for any single dimension less than 2 inches.

2. 1/8 inch for any single lineal dimension 2 inches or more or aggregate of measurements to 10 feet, even.

3. 1/4 inch for any aggregate of measurements exceeding 10 feet.

B. Insulation joint gap, minimum=0 maximum=3/16"

C. Lumber

1. Straightness, no bows exceeding 0.1%, i.e., 1/8" in 10 ft, 1/16" in 5 ft.

2. No twisted or split lumber allowed.

3. Moisture content not to exceed 14% when installed.

SPECIFIER: Supply a pro format copy of AF Form 1063 to this specification and a supply of blank forms to the contractor at the preconstruction conference.)

4.05. QUALITY CONTROL RECORD: Complete AP Form 1063, daily, as follows (see completed sample):

A. Top section:

1. Insert date and record number.

2. Insert weather description and temperature.

3. Indicate crew start/stop times.

4. Indicate your start/stop times.

5. Indicate total roof area.

6. Indicate roof area completed previous to date.

B. Products section. This section is divided into major categories. Each category may include several materials:

1. Examine each material within the category and check the proper box.

2. Check the "Not Applicable" box for materials not included in today's work.

3. Assure that all materials in a category comply with the contract to result in a check in the "Complies" box. To determine compliance, compare the material with the project specifications and drawings, and also with the approved manufacturer's literature submitted. Since materials other than those covered by the components listed may be used, enter their compliance in the "All Other Materials" category.

C. Execution section:

1. The work item numbers in this section of the record correspond to the work items in these basic QC requirements. The work items are specification items considered to be of major concern. These items are in the basic QC requirements for convenience and tabulation.

2. Performance of the "Actions" below the work item will result in an entry in the proper box on the QC record. Specification items not in the basic QC requirements must also be considered, and their acceptability grouped and documented in the "Other" box.

D. Variance section:

1. An entry in any "Varies" box under the "Products" or "Execution" sections requires an explanation of the variance in this section. The explanation should be limited to a description of the variance only; reasons for variances are not necessary.

2. Indicate action taken to resolve each variance to result in complying work. If a variance is not resolved on the same day it occurs, the number of that day's record must be entered in the space provided on records for all succeeding days, until the variance is resolved.

E. Closing section: Sign the record at the end of the workday and submit it to the government inspector.

4.06. WORK ITEMS: (corresponds to work item under Execution on AF Form 1063)

Work Item 1: Do not expose materials to moisture in any form before, during, or after delivery to the site.

Action: Inspect materials upon delivery for intact manufacturer's shipping containers. Verify the vehicle delivering materials provided adequate cover for protection of materials. Inspect materials for evidence of contact with moisture before acceptance. Inspect job site storage; ascertain enclosed storage to protect materials from moisture from any source. Observe material handling from storage areas to roof. Delivery to job site requires the same attention as delivery to storage area. Mark conspicuously all materials exposed to any form of moisture and have them permanently removed from the project site.

Work Item 2: Execute the work so that each area of the installation is completed ("dried in") on the same day it is begun. Included are all flashings and related parts to complete assembly.

Action: Determine the area of work planned and ascertain that enough materials are at hand to complete it. Inspect work at day's end, verify completion to tie in point.

Work Item 3: Install temporary water cutoffs and tie ins at the end of each work day. Remove cutoffs and tie ins on resuming work day so that all vertical faces of insulation are exposed.

Action: Observe tie in to verify that insulation joints are staggered and no moisture has intruded. Complete all field seams, and secure and make watertight all membrane terminations before the end of each work day.

Work Item 4: Except for expedient temporary work, do not proceed with roofing work during inclement weather.

Action: During bad weather, ascertain that work being done is only temporary and protects the facility and previously completed roofing system. Assure that all temporary work is removed before installation of permanent components when work is resumed.

Work Item 5: Do not apply roofing system components if moisture in any form can be seen or felt on the substrate to which the components will be applied. Insulation and/or substrate shall be free from debris, sharp objects, films or other contaminants.

Action: Ascertain no moisture is on deck, vapor barrier, or insulation layers before applying subsequent materials. If there are objects present which present a physical danger to the membrane, they are to be swept off or smoothed out. Water shall be broomed or pumped off and the surface allowed to dry before laying insulation or membrane. Other contaminants which may be present and not addressed in the specification shall be prevented from coming into physical contact with the sheet.

Work Item 6: Rolls of membrane are to be lifted using slings or by the ends. Chains, cables or similar small diameter materials are not to be used unless padded with two layers of membrane.

Action: Check lifting points for evidence of cuts or punctures on padding material or packaging. If damage is evident, very closely examine areas under damage for evidence of cuts or pinholes.

Work Item 7: Provide method to move rolls without damaging membrane.

Action: Use carts or buggies. If it is necessary to move rolls without carts or buggies, the area over which the roll will be moved shall be cleared and inspected for the presence of objects which could puncture the membrane. After rolling rolls, inspect foremost outside layer for any evidence of punctures or damage.

Work Item 8: Allow panels to relax in place for 30 minutes minimum prior to seaming.

Action: Wait 30 minutes. Panels seamed in place too soon shall be cut loose, allowed to relax, and then stripped back in place.

Work Item 9: If traffic of any kind over the partially or fully completed roofing is unavoidable, provide and use adequate plank or plywood protection for the roofing.

Action: Inspect activities and methods used to transport materials over the completed or partially completed roofing system. Check adequacy of planks or plywood to protect system.

Work Item 10: Do not load or permit any part of a structure to be loaded with a weight that will adversely affect is safety.

Action: Assure that runways (such as wood planks or plywood) are used to distribute the load of materials and equipment hauling over the deck so as not to cause deflection of the deck. Check for broken welds on bends in metal decking because of materials or equipment handling.

Work Item 11: Removal of existing materials must result in clean, dry substrate, except for residual stains, providing a surface suitable to apply new materials.

Action: Inspect substrate for excessive roughness, cracks, holes, deleterious coatings, or deteriorated condition. Assure that decking or other substrate determined to be defective is. repaired, replaced, or brought to the attention of the Contracting Officer. Assure that deck joints are sealed to prevent passage of moisture.

Work Item 12: Ensure that insulation boards, cant strips, and tapered edge strips are adequately secured.

Action: Ensure that the first layer of insulation is fully secured to the deck with mechanical fasteners in accordance with Factory Mutual I-90 and membrane manufacturer's requirements. Measure the distance from the outer row of fasteners to the perimeter. Count and locate fasteners with respect to insulation boards. Test bond of insulation boards, cant strips, and tapered edge strips by trying to lift them after installation. Materials that are readily lifted without fracture are not securely fastened.

Work Item 13: Apply elastomeric membrane according to manufacturer's current technical installation manual for the system to be installed.

Action: Refer to manufacturer's manual and ascertain the proper number, type, and length of fasteners are being used correctly, the correct laps are being used at all splices, that volatiles are allowed to dry off cements before jointing (if used), that sealing/fastening tapes are applied properly, and edge/lap seal is adequate and continuous.

Work Item 14: Clean seam area using techniques required by manufacturer's specification.

Action: This is the most critical factor and should be monitored very carefully. Lap adhesion depends on proper cleaning of both mating surfaces. If incorrectly cleaned, seams are to be taken apart and relapped for splicing. A 6" wide uncured flashing shall be centered over all field seams.

Work Item 15: Probe seams for defective adhesion.

Action: Check the outside edge of the seam using a pointed metal probe along the length of the lap area prior to strip-in of seam. The completed lap shall be visually free of any voids, fishmouths, wrinkles, or unattached areas, and shall lay flat.

Work Item 16: Pourable sealer must be set up firm and have a crown to drain.

Action: Use a low speed on an electric drill to assure complete mixing of resin and hardener.

Work Item 17: Base flashing shall be installed with no bridging.

Action: Flashings having a bridge wider than 1/2" shall be cut and recovered or replaced.

SPECIFIER: Delete products or items that do not apply to the project. Add items as needed; renumber as necessary.)

ELASTOMERIC MANUFACTURER
PRE-AWARD CERTIFICATION SUBMITTAL
Submittal #1

The following statement is required from the elastomeric manufacturer. The elastomeric manufacturer is defined as the roof membrane product manufacturer who may or may not manufacture the other system components, such as metal or other flashings, insulation, and fasteners.

This is to advise that_____(roofing contractor/ subcontractor) is an approved applicator of our roofing system and is capable of obtaining our 15-year labor and materials warranty. We will execute the Air Force 15-year warranty certification upon the successful completion of all work in accordance with the project plans and specifications or as modified to comply with our 15 year roofing system requirements, which ever is most stringent.

We have reviewed the System Summary Shoot for Project No._____ at _____ (location). We certify that the roofing systems listed below and describe in the attached product literature are suitable for use with the roof system construction specified for this project as it relates to normal wear and exposure to the weather.

We certify that the specified insulations are compatible with the membrane and would qualify for our 15 year materials and labor warranty. We accept responsibility for defects or failure of, or improper application of, roof insulation used as a base over which the roofing is applied, except the roof deck.

We understand that proposed changes relating to the roofing system will be submitted for our review and acceptance. A signed copy approving the concept of the change will be returned to the Contracting Officer.

Building Number(s)	Roofing System Designation (Membrane)	(Insulation)

A technical representative can be side available to attend the pre-construction conference to discuss proper installation procedures for our EDPM system. A technical representative will also be available to make at least one in-progress inspection and one final acceptance inspection of the installation.

Roofing Manufacturer
Firm Name:_____
Address:_____

Authorized Representative
Signature:_____
Printed or Typed Name:_____
Signed This_____Day of_____19_____

1. EPDM System Literature
2. Insulation Literature

Atch 1

System Summary Sheet
Submittal #2

(To be completed and signed by an approved roofing contractor and elastomeric (EPDM) manufacturer prior to contract award.)

This is to notify you that we shall apply for your full 15 year labor and materials warranty for the following project.

Solicitation No._____ Name of Building_____
Address of Building:_____
Type and Use of Building_____
[] New Building [] Recover [] Tear Off
No of Squares____ Mfg Spec #_____ Feet of Flashing____ Mfg Spec #_____

Description of Project:_____

Roof Slope:_____ Does the Roof have adequate drainage? [] Yes [] No

Deck: [] Steel Gauge_____ Joist Spacing_____ Width of Rib_____
[] Wood Type_____ Thickness_____ Joist Spacing_____
[] Lightweight Concrete Type_____Min. Thickness_____
[] Concrete Type_____ [] Structural Wood Fiber Trade Name_____
[] Gypsum Type_____ [] Other (Specify)_____

Vapor Retarder: [] No [] Yes [] Old [] New Type_____

New Insulation: [] Fiberboard [] Perlite [] Isocyanurate [] Other_____
[] EPS [] Urethane [] Cellular Glass [] Fiberglass
[] Phenolic Attachment [] Mechanical Fastener
[] Type_____ [] Hot Asphalt
Insulation Manufacturer_____ No. of Layers___
Thickness_____

Recover Info: Number of Existing Roofs?_____
Existing Surface [] Smooth [] Gravel [] Cap Sheet
Loose Gravel to be Removed? [] Yes [] No
Wet Insulation? [] Yes [] No
Waterlogged areas to be removed? [] Yes [] No
Roof Vents to be used? [] Yes [] No Spacing_____

This job will be completed in accordance with the contract specifications or the latest issue of the EPDM manufacturer "Commercial Roofing Specifications" manual, which ever is most stringent, and we will use only the undersigned manufacturer's products unless other products are approved by the manufacturer.

We plan to start this job on_____ We plan to complete the job on_____

Name of Roofing Contractor/Subcontractor:_____ Phone No._____
Address:_____
Signature of Company Official_____ Title _____ Print Name____

We acknowledge your notification that the U.S. Government 15-year EPDM Warranty will be required on the roof described above and will sign and issue this warranty/guaranty to the government upon your successful completion of

this project. There will be a charge to you of $_____.

Manufacturer_____

Authorized Representatives:_____Date:_____

SUBMITTAL 3

APPOINTMENT OF QUALITY CONTROLLER

_____(Name) is appointed as quality controller on Project_____ with the authority to regulate the quality of the work so that it conforms to the contract. The quality controller is authorized to order discontinuance of any operation causing nonconforming work.

The quality controller is experienced in the supervision and inspection of EPDM construction similar to that required in this contract. The quality controller understands all requirements of these specifications.

Name of Firm_____

Address_____

Telephone_____

Authorized Representative's Signature_____

Printed or Typed Name_____

Date_____

I acknowledge receipt of this letter.

Quality Controller's Signature_____

Printed or Typed Name_____

Date_____

ETHYLENE PROPYLENE
DIENE MONOMER (EPDM)
SUBMITTAL #4
15-YEAR LABOR AND MATERIAL WARRANTY

WARRANTY COVERAGE

This Ethylene Propylene Diene Monomer (EPDM) System is delivered to the United States Government subject to a full material and workmanship warranty for 15 years that guarantees that the manufacturer will pay all costs necessary to maintain the EPDM roofing membrane and flashing system in a watertight condition during the life of the warranty.

The specified roof system is equal to and comparable to our (manufacturer's name) 15-year system design and the insulations specified are compatible with our material. As the manufacturer of this system, we also accept responsibility for making repairs to the roofing system at no additional cost to the government, to correct defective materials and workmanship down to the structural deck.

If the manufacturer fails to make required emergency and permanent repairs during the warranty period, as stated after notice by telephone from the contracting officer, the government may have the work done by other authorized applicators and charge the cost to the manufacturer. The warranty provisions of this contract apply notwithstanding government inspection and acceptance. A separate warranty is required for each building. Failure to perform the work, resulting in the government having the work performed, will not void this warranty.

TERMS, CONDITIONS, LIMITATIONS:

Emergency repairs shall be made by the manufacturer or his licensed applicator within 48 hours of receipt of notice by telephone from the contracting officer and weather permitting, the manufacturer agrees to permanently repair the affected areas within 30 days by restoring them to a watertight condition, without cost to the government. If it is determined that leaks were caused by either an exclusion from coverage or a specific condition listed below, the manufacturer will repair the defects and payment will be made by the government based on invoices supplied by the manufacturer.

The monetary liability to the manufacturer for replacement of a defective system is limited to the cost of the original installation of the total roof system.

EXCLUSIONS FROM COVERAGE

1. Natural disasters, acts of God (lightning, hurricanes, tornadoes, sustained winds exceeding 72 MPH as recorded at the nearest meteorological center, earthquakes, hail.)

2. Acts of negligence or abuse and misuse by Government personnel, accidents, vandalism, civil disobedience, war, or damage caused by falling objects.

EXCLUSIONS FROM COVERAGE (contd.)

3. Damage by structural failure, settlement, movement, distortion, warpage, or displacement of structure.

4. Failure of material or flashing caused by movement of metal work not supplied by manufacturer issuing the warranty.

5. Leaks caused by repairs or alterations of roof system or installation of structures, fixtures or utilities on or through roof without prior written approval of manufacturer.

6. Storage of material on roof.

7. Moisture entering roof system through walls, coping, or any part of building structure except the roof, including from adjacent building.

8. Fire.

9. Faulty construction or design of building, including parapet wall, copings, chimneys, skylights, vents, or of structural roof deck.

10. Infiltration or condensation of moisture in or through underlying area; vapor condensation beneath the roof greater than the acceptable ambient moisture content for the given material as established by the appropriate American Society for Testing and Materials (ASTM) standard in effect at the time of installation.

11. Under no circumstances is the manufacturer responsible for damages to the building, its contents or structural roof deck.

12. Membrane deterioration due to chemical attack from: HVAC oil, lubricating oil, solvents or other petroleum products.

SPECIFIC CONDITIONS THAT VOID THE WARRANTY

1. Failure by the owner to use reasonable care in maintenance; failure to follow manufacturer's written maintenance instructions.

2. Failure of owner to make repairs to leaks not covered by manufacturer's warranty.

3. Repair work by any contractor other than EPDM manufacturer's licensed applicator or use of unapproved material.

4. Changes in building usage which may affect roof performance unless approved in writing by the manufacturer prior to such change.

DETERMINATION OF RESPONSIBILITY

A government representative will call the manufacturer immediately when a leak is discovered. Receipt of notice by telephone or in writing from the contracting officer is evidence that the contracting officer has had the roof examined by a technically qualified representative of the government and has determined, based on this examination, that none of the above exclusions or specific conditions apply and the manufacturer is obligated to make the repairs.

After completion of the 48 hour emergency repair, the manufacturer, to avoid application of the warranty, must notify the contracting officer in writing of the existence of an exclusion stated herein. Failure to provide such notice will preclude the manufacturer from later disputing the coverage of the warranty. The burden to establish the existence of an exclusion or specific condition affecting the warranty is on the manufacturer.

After the occurrence of an exclusion from coverage or a specific condition which renders the warranty ineffective, the warranty shall be allowed to continue as long as the government returns the roofing system to its original condition and the manufacturer is allowed to make or oversee the repair. The manufacturer and his authorized installer will be paid for time and transportation to make or supervise the non-warranty repair.

BENEFICIARY

The warranty period starts on the date the roofing system (work) is accepted by the government from the roofing manufacturer's technical representative and the roofing contractor.

It is understood by the manufacturer and his licensed/approved applicator (contractor) that the warranty provided herein shall be for the benefit of the United States Government.

BURDEN OF PROOF

The manufacturer's shall have the burden of proving the existence of a condition which established an exclusion from coverage, or which would render the warranty ineffective or null and void.

OTHER WARRANTIES

The warranty contained herein shall be in addition to and not in lieu of any warranty otherwise applicable to the work or materials used in the contract.

SIGNATURE

Manufacturer Firm Name_____

Address_____

Authorized Representative's Signature_____

Date _____

Authorized Representative's Name_____

Title_____

Manufacturer's Warranty/Serial
Number for Building Number _____

Located at _____

Warranty/Guaranty Expiration Date_____

SUBMITTAL 5

Roofing Membrane Sample Identification Tags:

Include this attachment in the envelope with sample. Use indelible ink or typing.

Sample No._____ Proj No._____

Air Base_____ Bldg No._____

Elastomeric Membrane Mfr._____

Elastomeric Type _____

Elastomeric Thickness_____

Elastomeric Lot Number_____

SUBMITTAL #6

As Built Roof System Summary:

After completion of construction, accurately fill in the information required on this sheet. If more than one system applies to the same building, complete one sheet for each system. Submit in quadruplicate before final acceptance.

Bldg No._____ Project_____ _____ AFB

Total project area in square feet_____

Building area where this system is installed_____
_____.
Deck type_____ Deck slope_____

Underlayment components (type & number)_____

Underlayment attachment method_____

Insulation:
Type:_____

Manufacturer:_____

First layer: thickness:_____ Attachment:_____

Second layer: thickness:_____ Attachment:_____

Elastomeric Membrane:

Manufacturer_____

System Designation_____

Type of Elastomer_____

Type of Adhesive_____

Type of Lap Adhesive_____

Type of Lap Sealant_____

Was this a new system installed over existing roof?_____

Roof completion date_____

Roofing Contractor:_____
(NAME)
_____
(ADDRESS)

Day:_____ 24 Hour:_____
(Telephone)

DO NOT

Make Repairs or Alterations to this roof!

WITHOUT APPROVAL
FROM THE
BASE CIVIL ENGINEER

THIS ROOF IS UNDER WARRANTY UNTIL (1) BY

MANUFACTURER (2)

ADDRESS
CITY, STATE, ZIP CODE
PHONE: AREA CODE/NUMBER

SIGNS — TO BE POSTED AS SPECIFIED

(1) INSERT WARRANTY EXPIRATION DATE 15 YEARS FROM FINAL ACCEPTANCE.
(2) INSERT THE MANUFACTURER'S NAME, ADDRESS, AND PHONE NUMBER.

QUALITY CONTROL RECORD

RECORD NO. 10	DATE 31 Mar 90		
PROJECT NUMBER OFF 89-0050	BLDG NO. 300	ROOFING CREW	QUALITY CONTROLLER
WEATHER (Describe) Sunny & Hot	AVERAGE TEMPERATURE 91°	START 730 AM PM	START 730 AM PM
		STOP 430 AM PM	STOP 430 AM PM
TOTAL ROOF AREA (Square) 1000	PREVIOUSLY COMPLETED 250 SQS	COMPLETED TODAY 25 SQS	TEST SAMPLES REMOVED 1

PRODUCTS (See Project Specifications) (Check Appropriate Box Below)				EXECUTION (See Quality Control Guide) (Check Appropriate Box Below)							
COMPONENTS (Type, Quantity, Size)	COM-PLIES	VARIES	NOT APPLI-CABLE	WORK ITEM	COM-PLIES	VARIES	NOT APPLI-CABLE	WORK ITEM	COM-PLIES	VARIES	NOT APPLI-CABLE
UNDERLAYMENT			✓	1	✓			13	✓		
INSULATION	✓			2	✓			14	✓		
MEMBRANE	✓			3	✓			15	✓		
COMPO. FLASHING	✓			4	✓			16	✓		
SHEET METAL	✓			5	✓			17	✓		
FASTENERS	✓			6	✓			18			
WOOD	✓			7	✓			19			
SEALANTS	✓			8	✓			20			
EXPANSION JOINTS	✓			9	✓			21			
ALL OTHER MATERIALS	✓			10	✓			22			
				11	✓			23			
				12	✓			OTHERS			

SAMPLE

EXPLAIN VARIANCE (If none write NONE)

None

UNRESOLVED VARIANCES ON RECORDS NOS.

Q.C. Record No. #8

ACTION TAKEN TO RESOLVE VARIANCE

50 Square feet of insulation left on roof over night was removed from job.

I CERTIFY THAT I HAVE PERSONALLY PERFORMED THE REQUIRED TESTS AND MEASUREMENTS AND ATTEST THAT THIS Q.C. RECORD IS AN ACCURATE RECORD OF THE WORK ACCOMPLISHED TODAY.

QUALITY CONTROLLER (Signature) Ron T. Smith

RECEIVED BY (Signature) Neil R. Roof DATE 31 Mar 90

AF FORM SEP 79 1063

Atch #8

ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLS

ETL Number	Title	Date Issued
82-2	Energy Efficient Equipment	10 Nov 82
83-1	Design of Control Systems for HVAC	16 Feb 83
	Change No. 1 to ETL 83-1, U.S. Air Force Standardized Heating, Ventilating & Air Conditioning (EVAC) Control Systems	22 Jul 87
83-3	Interior Wiring Systems, AFM 88-15 Para 7-3	2 Mar 83
83-4	EMCS Data Transmission Media (DTM) Considerations	3 Apr 83
83-7	Plumbing, AFM 88-8, Chapter 4	30 Aug 83
83-8	Use of Air-to-Air Unitary Heat Pumps	15 Sep 83
83-9	Insulation	14 Nov 83
84-2	Computer Energy Analysis	27 Mar 84
	Change 1 Ref: HQ USAF/LEEEU Msg 031600Z MAY 84	1 Jun 84
84-7	MCP Energy Conservation Investment Program (ECIP)	13 Jun 84
84-10	Air Force Building-Construction and the Use of Termiticides	1 Aug 84
86-2	Energy Management and Control Systems (EMCS)	5 Feb 86
86-4	Paints and Protective Coatings	12 May 86
86-5	Fuels Use Criteria for Air Force Construction	22 May 86
86-8	Aqueous Film Forming Foam Waste Discharge Retention and Disposal	4 Jun 86
86-9	Lodging Facility Design Guide	4 Jun 86
86-10	Antiterrorism Planning and Design Guidance	13 Jun 86
86-14	Solar Applications	15 Oct 86
86-16	Direct Digital Control Beating Ventilation and Air Conditioning Systems	9 Dec 86
87-1	Lead Ban Requirements of Drinking Water	15 Jan 87
87-2	Volatile Organic Compounds	4 Mar 87
87-4	Energy Budget Figures (EBFS) for Facilities in the Military Construction Program	13 Mar 87
87-5	Utility Meters in New and Renovated Facilities	13 Jul 87
87-9	Prewiring	21 Oct 87

ENGINEERING TECHNICAL LETTERS (ETL)

SECTION A - CURRENT ETLS

ETL Number	Title	Date Issued
88-2	Photovoltaic Applications	21 Jan 88
88-3	Design Standards for Critical Facilities	15 Jun 88
88-4	Reliability & Maintainability (R&M) Design Checklist	24 Jun 88
88-5	Cathodic Protection	2 Aug 88
88-6	Heat Distribution Systems Outside of Buildings	1 Aug 88
88-7	TEMPEST & High Altitude Electromagnetic Pulse (HEMP) Protection for Facilities	24 Aug 88
88-8	Cholorfluorocarbon (CFC) Limitation in Heating, Ventilating and Air-Conditioning (BVAC) Systems	4 Oct 88
88-9	Radon Reduction in New Facility Construction	7 Oct 88
88-10	Prewired Workstations Guide Specification	29 Dec 88
89-1	1988 Energy Prices and Discount Factors for Life-Cycle Cost Analysis	6 Feb 89
89-2	Standard Guidelines for Submission of Facility operating and Maintenance manuals	23 May 89
89-3	Facility Fire Protection Criteria for Electronic Equipment Installations	9 Jun 89
89-4	Systems Furniture Guide Specification	6 Jul 89
89-6	Power Conditioning and Continuation Interfacing Equipment (PCCIE) in the Military Construction Program (MCP)	7 Sep 89
89-7	Design of Air Force Courtrooms	29 Sep 89
90-1	Built-Up Roof (BUR) Repair/Replacement Guide Specification	23 Jan 90
90-2	General Policy for Prewired Workstations and Systems Furniture	26 Jan 90
90-3	TEMPEST Protection for Facilities Change 1 Ref: HQ USAF/LEEDE Ltr dated 20 April 90, Same Subject	20 Apr 90
90-4	1990 Energy Prices and Discount Factors for Life-Cycle Cost Analysis	24 May 90
90-5	Fuel and Lube Oil Bulk Storage Capacity for Emergency Generators	26 Jul 90
90-6	Electrical System Grounding, Static Grounding and Lightning Protection	3 Oct 90
90-7	Air Force Interior Design Policy	12 Oct 90
90-8	Guide Specifications for Ethylene Propylene Diene Monomer (EPDM) Roofing	17 Oct 90

SECTION B - OBSOLETE ETLS

No.	Date	Status
82-1	10 Nov 82	Superseded by ETL 83-10, 86-1, 87-4
82-3	10 Nov 82	Superseded by ETL 83-5, 84-2
82-4	10 Nov 82	Superseded by ETL 84-7
82-5	10 Nov 82	Superseded by ETL 84-1, 86-13, 86-14
82-6	30 Dec 82	Cancelled
82-7	30 Nov 82	Cancelled
83-2	16 Feb 83	Superseded by ETL 84-3
83-6	24 May 83	Cancelled
84-3	21 Mar 84	Cancelled
84-4	10 Apr 84	Superseded by ETL 86-7, 86-15, 87-5
84-5	7 May 84	Superseded by ETL 84-8, 86-11, 86-18,
84-6	Not Issued	Cancelled/Not Used
84-9	5 Jul 84	Superseded by ETL 88-7
86-3	21 Feb 86	Superseded by ETL 86-4
86-6	3 Jun 86	Superseded by ETL 86-11, 86-18, 88-6
86-7	3 Jun 86	Superseded by ETL 86-15
86-12	3 Jul 86	Superseded by ETL 90-2
86-13	18 Aug 86	Superseded by ETL 86-14
86-15	13 Nov 86	Superseded by ETL 87-5
86-17	17 Dec 86	Superseded by ETL 89-6
86-18	18 Dec 86	Superseded by ETL 88-6
87-3	12 Mar 87	Superseded by ETL 87-6, ETL 88-5
87-6	21 Aug 87	Superseded by ETL 88-5
87-7	14 Oct 87	Superseded by ETL 89-1
Chg 1	30 Dec 87	Superseded by ETL 90-1
88-1	5 Jan 88	Superseded by ETL 89-2
89-5		Issued as ETL 90-7